

Chairman Joe Manchin III
Senate Committee on Energy and Natural Resources

**PRIMER ON HYDROGEN
PROVISIONS IN THE
INFRASTRUCTURE INVESTMENT
AND JOBS ACT**

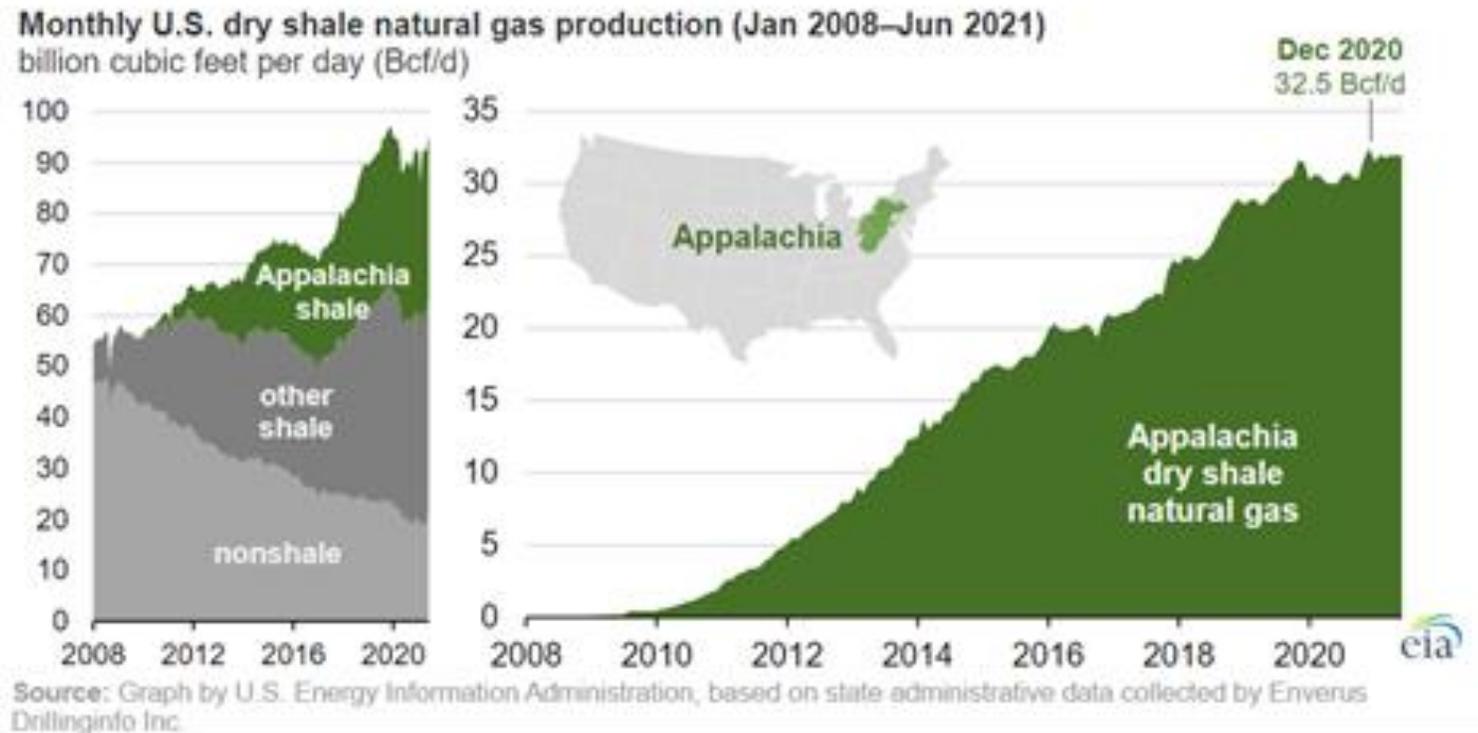
**WEST VIRGINIA CLEAN HYDROGEN
HUB WORKING GROUP
ORGANIZATIONAL MEETING**
FRIDAY, FEBRUARY 25, 2022



Clean Hydrogen (H2) Hubs

Bipartisan Infrastructure Law funded **\$8 billion** for **at least 4 hydrogen hubs**

Two hubs shall be in regions with the greatest natural gas resources. Appalachia is the largest natural gas producing region in the U.S.



What Constitutes a Hub?

A network of clean H2 producers, potential clean H2 consumers, and connective infrastructure. Each Hub will...

Demonstrate the production of clean H2

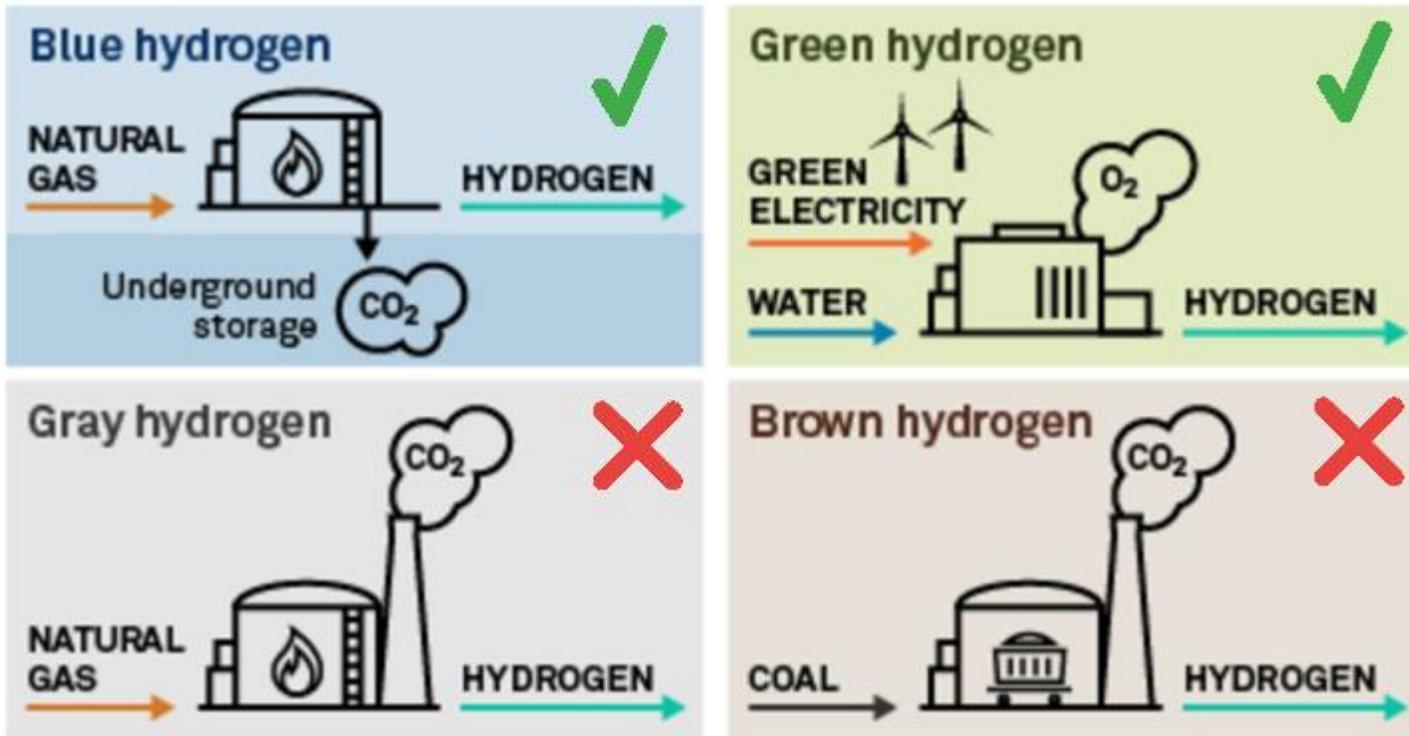
- At least 1 hub from **fossil fuels with carbon capture**
- At least 1 from **renewables**
- At least 1 from **nuclear energy**

Demonstrate the use of clean H2

- At 1 one for **electric generation**
- At least 1 in **industrial applications**
- At least 1 for **residential and commercial heating**
- At least 1 in **transportation**

Clean Hydrogen Production

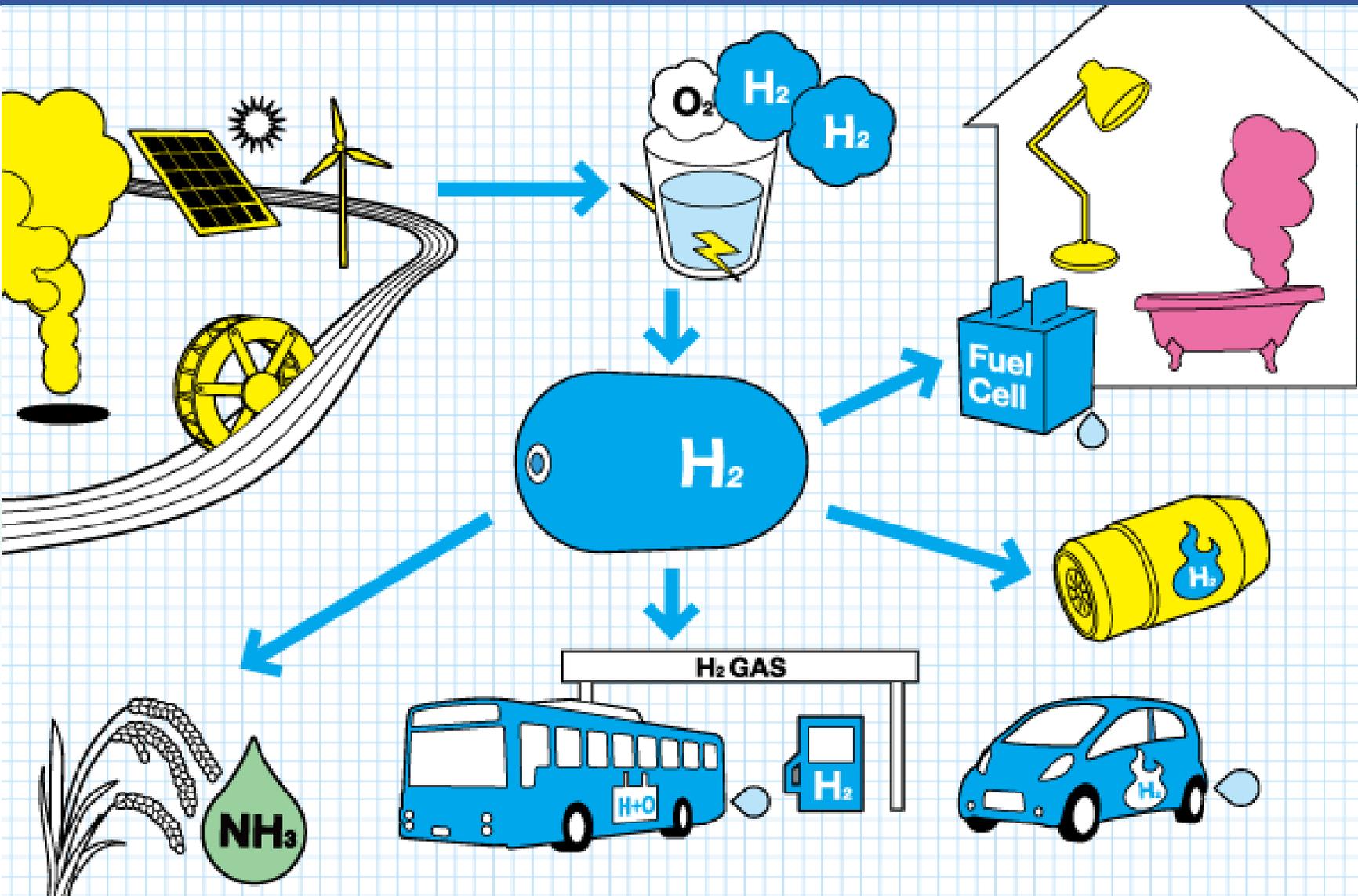
Clean H₂ production standard = carbon intensity of **2 kg of CO₂/kg of H₂** produced, or *less*. This includes blue, green, and pink H₂.



Industry has informally adopted colors to differentiate H₂ technologies

- **Blue H₂** uses Steam Methane Reformer (SMR) with CCUS
- **Green H₂** uses electrolysis with renewable electricity
- **Pink H₂** (not pictured) uses electrolysis with nuclear energy
- **Gray & Brown H₂** uses SMR without CCUS

Clean H₂ End-Uses



- **Transportation:** cars, forklifts, aviation, maritime
- **Industrial:** refining, chemical plants, cement, steel, manufacturing
- **Agriculture:** ammonia and fertilizer
- **Power Generation:** coal and natural gas plants
- **Residential & Commercial Heating;** blending into pipes
- **Storage** for grid stability

DOE Hub Development Timeline

- **Mid-Feb 2022:** Issued Request for Information (RFI) for implementation strategy
- **May 22, 2022:** Funding Opportunity Announcement due
- **May 2023:** Selection of Hubs due

Opportunities for West Virginia

Coalitions will be considered a priority for hub selection

- ***Regional resources for production and infrastructure include***
 - Fossil resources with CCUS, future transition to renewables
 - Access to significant natural gas and saline storage of CCUS
 - Salt, limestone, and sandstone formations for potential CCUS or H2 storage
 - Coal and natural gas plants can be retrofitted for hydrogen production/use
- ***End-users in the region include potential for***
 - Use in power gen and back-up power (coal and natural gas plants)
 - Steel, cement, and chemical industries including refining facilities.
- ***Access to natural gas infrastructure and railroad right of ways to transport H2***